Ocean gales and storms, September, 1931—Continued

Vessel	Voyage		Position at time of lowest barometer		Gale began	Time of lowest barometer	Gale ended	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH PACIFIC OCEAN			° ′	° ′				*Inches*					
Victoria, Am. S. S.	Seattle	Nome	50 50 N	134 05 W	Sept. 4	Noon, 4	Sept. 5	29.34	SE	SSW	W	SSW, 9	SW-W.
Siamese Prince, Br. M.S.	Los Angeles	Shanghai	34 44 N	172 20 E	do	7 a., 5	do	[1]29.89	SW	SSW, 8	NW	NW, 8	SW-W-NW.
Do	do	do	34 54 N	153 56 E	Sept. 7	11 p., 7	Sept. 8	[1]30.00	SW	do	NW	SSW, 8	WSW-NW.
Chief Capilano, Br. S. S.	Taketoyo	Vancouver	34 41 N	139 42 E	Sept. 9	Noon, 10	Sept. 11	29.65	NE	N, 7	NNW	N, 8	N-NNW.
San Luis Maru, Jap. M. S.	Elwood	Yokohama	34 00 N	155 50 E	Sept. 11	2 a., 13	Sept. 13	[1]29.42	SSW	ESE, 6	N	SE, 8	SE-ESE-E.
Courageous, Am. M. S.	Shanghai	San Pedro	39 34 N	138 44 E	Sept. 12	2 p., 12	Sept. 12	29.16	SE	SE, 12	SE	SSE, 12	SE-S-W.
Kurohime Maru, Jap. S. S.	Osaka	Portland	48 51 N	178 28 E	Sept. 18	1 p., 18	Sept. 18	29.38	WSW	W, 8	W	W, 8	WSW-W.
Do	do	do	49 20 N	166 16 W	Sept. 19	11 a., 20	Sept. 20	28.40	N	NNW, 12	WSW	NNW, 12	N-NW.
Olympia, Am. S. S.	Cebu, P. I.	Los Angeles	40 16 N	168 30 W	do	3 p., 19	do	[1]29.12	NE	N., 9	W	WNW, 12	NNW-WNW.
Courageous, Am. M. S.	Shanghai	San Pedro	47 30 N	158 25 W	do	10 a., 20	do	29.36	NE	SSW., 10	SW	SSW, 10	SSW-S.
Kiyo Maru, Jap. S. S.	Sado Is.	Los Angeles	46 05 N	154 30 W	do	4 a., 20	do	29.74	SSE	SE, 7	SW	SSE, 9	SSE-S.
Somedono Maru, Jap. S. S.	Miike	Port Angeles	49 32 N	171 00 W	Sept. 20	2 p., 20	do	29.54	N	NW, 8	NW	NW, 8	N-NW.
City of Vancouver, Can. S. S.	Osaka	Prince Rupert.	44 59 N	162 40 E	Sept. 21	8 p., 22	Sept. 23	29.65	W	W., 7	WNW	W, 8	Steady.
Granville, Pan. M. S.	Hong Kong	San Pedro	22 25 N	121 55 E	Sept. 23	4 a., 24	Sept. 24	29.62	SW	SSE, 8	S	S, 9	SW-S.
Asuka Maru, Jap. M. S.	Yokohama	San Francisco	36 36 N	143 54 E	Sept. 26	6 p., 27	Sept. 28	[1]29.64	SE	SE, 9	SSE	SE, 9	
Shoyo Maru, Jap. S. S.	do	do	47 45 N	163 30 W	Sept. 27	8 p., 28	Sept. 30	[1]29.41	SW	W	WNW	NW, 9	W-NW.
Hakubasan Maru, Jap. M. S.	do	do	48 02 N	164 24 W	do	do	do	29.54	S	WNW		NW, 9	
Victoria, Am. S. S.	Nome	Seattle	53 50 N	149 05 W	Sept. 29	4 a., 29	do	28.66	N	WNW	WSW	WSW, 9	
Yukon, Am. S. S.	Seattle	Seward	58 26 N	138 00 W	Sept. 30	2 a., 30	do	28.74	NE	NE, 8	N	NE, 8	4 points.
MEXICAN WEST COAST STORM REPORTS													
Marian Otis Chandler, Am. S. S.	Los Angeles	Philadelphia	16 00 N	98 00 W	Sept. 6	8 p., 6	Sept. 7	29.67	Var	E, 3	ENE	ENE, 8	E-Var.
Sea Thrush, Am. S. S.	Balboa	San Pedro	20 48 N	108 12 W	Sept. 9	—, 11	Sept. 12	29.45	SE	NE, 8	WSW	NE, 10	ENE-NE.
City of Elwood, Am. M. S.	do	do	21 00 N	107 52 W	Sept. 10	do	do	29.60	ESE	S, 8	SW	SSE, 8	S-SSE.
Astronomer, Br. S. S.	Los Angeles	Balboa	20 35 N	107 26 W	Sept. 11	5 a., 11	do	28.73	SE	SE	SSW	SxW, 10	SE-S-SSW.
San Raphael, Am. S. S.	Philadelphia	San Pedro	22 00 N	108 58 W	do	4 a., 12	do	29.53	SE	SW, 9	S	SW, 9	SSW-SW.
Chattanooga City, Am. S. S.	Balboa	do	20 27 N	107 35 W	do	—, 12	do	29.63	SE	SE, 7	SSW	SSE, 8	SE-SW.
W. S. Miller, Am. S. S.	Mazatlan	Cape San Lucas.	23 00 N	107 00 W[2]	do	9 p., 11	do	29.40	SSE	SE, 12	SW	SE, 12	Steady.
Malayan Prince, Br. S. S.	Colon	Los Angeles	15 30 N	101 30 W[2]	Sept. 13	4 p., 14	Sept. 14	29.58	WSW	WSW, 9	W	WSW, 9	
San Felipe, Am. S. S.	San Pedro	Balboa	17 45 N	103 25 W	Sept. 14	do	do	29.54	SE	E, 4	SW	E, 8	SE-E.
Willboro, Am. S. S.	Balboa	San Diego	18 11 N	104 01 W	Sept. 15	6 a., 15	Sept. 15	29.60	SE	SE, 7	SE	SE, 10	Steady.
Piave, It. S. S.	Colon	Los Angeles	20 00 N	106 00 W	Sept. 17	3 a., 17	Sept. 19		NW	NW, 6	NNW	—, 8	
Seminole, Br. M. S.	Panama	San Pedro	17 43 N	103 19 W	Sept. 20	4 p., 20	Sept. 20	29.64	ESE	E, 7	E	E, 8	ESE-E.
American Star, Am. S. S.	San Francisco	Canal Zone	18 00 N	104 00 W[2]	do	do	do	29.61	ESE		ESE	ESE, 9	
Ohioan, Am. S. S.	Los Angeles	New York	18 48 N	104 17 W	Sept. 21	4 a., 21	do	29.69	E	ExS, 8	ExS	ExS, 8	Steady.
Suriname, Am. S. S.	San Francisco	Cristobal	19 40 N	105 45 W	do	10 p., 21	Sept. 22	29.67	NE	ESE, 8	SE	ESE, 9	E-ESE.
New Jersey, Am. S. S.	San Pedro	New York	21 31 N	108 26 W	Sept. 22	8 p., 22	do	29.49	E	E, 7	SSE	SE, 9	
Thos. H. Wheeler, Am. S. S.	Balboa	San Pedro	22 09 N	109 18 W	do	7 p., 22	Sept. 23	29.35	E	E, 8	SSE	E, 8	E-ESE.
Arizonan, Am. S. S.	San Francisco	New York	23 00 N	110 00 W[2]	do	4 a., 23	do	29.72	E	ESE, 8	S	SE, 9	E-ESE.
Dorothy Luckenbach, Am. S. S.	New York	San Pedro	21 46 N	108 59 W	do	4 p., 22	do	29.47	SE	SE, 9	N	SE, 9	Steady.
Robin Hood, Am. S. S.	Longview	Balboa	25 00 N	113 00 W[2]	Sept. 23	3 a., 24	Sept. 24	29.75	NE	SE, 7	SSE	E, 9	
Willkeno, Am. S. S.	Los Angeles	Charleston	18 42 N	105 06 W	Sept. 27	5 a., 27	Sept. 27	29.60	NNE	E, 9	SE	ESE, 10	ENE-E.
Vega, Am. S. S.	San Diego	Balboa	18 45 N	104 40 W	do	4 a., 27	do	29.68	E	E, 7	SE	ExS, 8	E-ESE.
Chas. R. McCormack, Am. S. S.	San Pedro	do	18 52 N	105 49 W	do	Noon, 27	Sept. 28	29.13	NNE	ESE, 12	SE	ESE, 12	E-ESE.
Minnesotan, Am. S. S.	Los Angeles	New York	20 15 N	108 47 W	do	6 p., 27	do	29.76	ESE	ESE, 7	SE	ESE, 8	ESE-SE.

[1] Barometer uncorrected.

[2] Position approximate.

NORTH PACIFIC OCEAN

By WILLIS E. HURD

Atmospheric pressure.—With the coming of early autumn atmospheric pressure began to lessen over the upper waters of the North Pacific Ocean. Depressions became more frequent, and as they concentrated principally over the peninsula and neighboring Gulf of Alaska, it was here that the average center of the Aleutian LOW appeared during September. Pressures for the entire region, however, were above the normal for the month, as they were also in July and August.

The North Pacific anticyclone, while more restricted in area on the average than in August, remained for the most part well developed off the middle American coast and thence westward to about longitude 170° W. At Midway Island, however, as well as at coast stations of the United States, pressures were below normal.

Frequent cyclones and anticyclones appeared to the westward of longitude 160° E., but the average pressure was comparatively low in Asiatic waters south of the fortieth parallel, increasing thence northward for some distance.

The following table gives the barometric data for several island and coast stations in west longitudes, including Point Barrow on the Arctic Ocean:

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean and adjacent waters, September, 1931, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Point Barrow [1]	29.96	+0.06	30.34	18th	29.64	30th.
Dutch Harbor [1]	29.89	+0.13	30.44	26th	29.10	21st.
St. Paul [1 2]	29.87	+0.16	30.42	26th	29.36	16th.
Kodiak [1 2]	29.77	+0.06	30.22	23d	29.18	29th.
Midway Island [1]	29.93	−0.08	30.12	30th	29.76	11th.[3]
Honolulu [4]	29.99	−0.01	30.16	27th	29.86	3d.
Juneau [4]	29.86	−0.06	30.60	21st	29.00	29th.
Tatoosh Island [4 2]	29.98	−0.03	30.31	22d	29.57	18th.
San Francisco [4 5]	29.93	−0.01	30.11	29th	29.67	22d.
San Diego [4 4]	29.86	−0.08	29.99	3d	29.71	11th.

[1] P. m. observations in averages; a. m. and p. m. in extremes.
[2] For 29 days.
[3] And on other dates.
[4] A. m. and p. m. observations.
[5] Corrected to 24-hour mean.

Cyclones and gales.—During the early half of September comparatively quiet summer conditions prevailed along the upper trans-Pacific steamship routes, gales occurring only infrequently and over small areas. But from the 18th until the end of the month there was a sharp increase in the frequency and general severity of gales and an expansion of the areas of storminess.

The principal extratropical cyclone of the month seems to have originated near and to the northward of Midway Island about the 18th. It was first known as a severe storm on the afternoon of the 19th when the American steamer *Olympia* encountered it in gales of strong to hurricane force near 40° N., 168° W. The cyclone by this time was moving rapidly northward. On the 20th at 11 a. m. local time, the Japanese steamship *Kurohime Maru* experienced it as a northerly to westerly gale of hurricane force, lowest barometer 28.40 inches, near 49° N., 166° W. Earlier in the day southwesterly gales of force 11 were reported by another vessel from about 42° N., 162° W. On this date of the storm's greatest severity and widespread prevalence gales equaling or exceeding force 9 covered a region bounded roughly by longitudes 150° and 170° W., latitudes 40° to 52° N. The cyclone center, losing energy, passed east of Dutch Harbor, where the barometer fell to 29.10 inches on the morning of the 21st and by the 22d had entered the Arctic Ocean north of Alaska.

An eastward-moving LOW of less intensity from Siberia entered the Sea of Okhotsk on the 20th. After leaving the Kuril Islands it caused fresh to strong gales to the eastward on the 20th to 22d. On the 23d it crossed the central Aleutians into the Bering Sea, and by the 25th had overspread the Gulf of Alaska, where it remained with fluctuating intensity until the close of the month. Some eastbound steamships on the northern routes between the 22d and 30th remained under the influence of this disturbance for several days harassed by frequent fresh to strong gales.

South of latitude 40° gales, so far as reported, were infrequent and of moderate to fresh force only, except those due to disturbances of the Tropics.

Tropical cyclones—Typhoons.—In addition to a very small but violent typhoon off the southeast China coast, a description of which by the Rev. Miguel Selga, director of the Philippine Weather Bureau, appears elsewhere in this issue of the MONTHLY WEATHER REVIEW, at least three other typhoons occurred in September, two of which our own reports show to have been of great violence. Two of these cyclones originated in low latitudes east of the Philippines. One, forming early in the month, moved northward between the Nansei Islands and the mainland of China on the 9th and 10th. By the 11th it had acquired considerable energy south of Chosen, and on the 12th in the Japan Sea the report of the American motor ship *Courageous* indicates that it was by then, at least, of hurricane intensity. The storm crossed the northern island (Yezo) of Japan and on the 13th lay over the Sea of Okhotsk.

The other low-latitude storm crossed the Philippines between the 19th and 21st, and Taiwan on the 22d and 23d. It skirted the west coast of the Japanese Archipelago between the 25th and 28th and went northward into Siberia west of Sakhalin Island.

The third typhoon was apparently the most severe. It first appeared as a LOW west of the Ogasowara Islands on the 7th. It proceeded northeastward and when central some 200 miles east-southeast of Yokohama, or near latitude 33° 39′ N., 142° 56′ E., at 4:30 p. m. of the 10th, according to the special report of the American steamship *Patrick Henry* (R. A. Smith, second officer and observer) was of hurricane force from southeast by south. The position of the vessel was practically stationary for several hours. Light winds occurred at the vessel from 9:30 to 10 p. m. The lowest barometer, 28.20 inches (uncorrected), was read at 10 p. m. "at the end of the southerly winds." The wind was of hurricane force from 4:30 p. m. until midnight, except for the comparative calm at the vortex, but was of greatest violence after the shift to west. The typhoon continued on a northeasterly course until the 12th, when it was lost to observation near 40° N., 160° E.

Mexican west coast cyclones.—At least three cyclones with winds of force 11 to 12 occurred in these waters in September; in addition to one other instance in which winds of whole gale force were encountered by several ships in positions strongly indicating a tropical storm development and movement. These storms are discussed in considerable detail in another section of this REVIEW, where they are considered chronologically with associated storms moving into Mexico from the Caribbean area. A brief summary of the movements in the Pacific which were all quite regularly northwestward, closely paralleling the Mexican west coast, is presented here as a part of the record of month's weather over the Pacific.

The first storm, which caused the loss of the American steamship *Colombia* on the 12th, and took a number of lives in the Mexican town of Santa Rosalia on the 13th, was first in evidence as a moderate cyclonic storm about latitude 15° N., longitude 100° W., on the 6th and 7th. It ceased to be a damaging storm after reaching the upper part of the Gulf of California on the 14th, on which date another disturbance was developing in approximately the same location where the first had originated a week before. This second storm was of only moderate violence, and, after following a course almost like its predecessor into the mouth of the Gulf of California, disappeared by the 18th. The third and fourth storms developed somewhat farther from the coast about 12° N., 102° W., the earlier on the 20th, and the last on the 26th. The movement of the first after the 20th was somewhat problematical, but it appears however to have traveled about due northwestward causing gales in the vicinity of

25° N., 115° W., on the 24th, after which it seems to have diminished and disappeared. The last storm, beginning on the 26th, moved more northward, and, like the first two of the month, entered the Gulf of California and disappeared after the 29th.

Winds at Honolulu.—The prevailing wind direction at Honolulu continued from the east, with the maximum velocity of 25 miles an hour from the east on the 25th.

Fog.—The occurrence of fog on the north Pacific lessened appreciably in September along the northern routes, and was reported on only 1 to 4 days in any 5° square. The region of most frequent occurrence lay along the American coast between 30° and 50° N., with about 30 per cent of the days with fog between Point Conception and the mouth of the Columbia River.

The Moyle-Allen airplane flight over the northwestern Pacific.—On September 8, Don Moyle and Cecil A. Allen, of California, took off from Sabishiro Beach, Japan, 375 miles north of Tokyo, attempting a nonstop flight of 4,465 miles to Seattle. They were thereafter lost until it was learned 10 days later that they had been forced down by stormy weather, landing upon a remote island of the western Aleutians. After seven days, they hopped off for Siberia, landing on the 17th on the Kamchatka coast, 1,900 miles north-northeast of their starting point of the 8th. They later flew to Nome.

THE SILVERSANDAL TYPHOON, SEPTEMBER 1 TO 4, 1931

Abridged from a report submitted by Rev. MIGUEL SELGA, S. J., director of the Manila Weather Bureau

To pass from a gentle breeze into a whole gale in the short interval of two hours without any apparent sign of a brewing storm was the unusual experience on September 1, 1931, of the 3,693-ton motor ship *Silversandal*, of the Silver Line. In its voyage from Shanghai to Manila the motor ship encountered gentle easterly breezes down the China coast and the Formosa Channel on the last day of August and the early morning of the 1st day of September, with the barometer remaining stationary at 755.8 mm. for eight hours. The usual precursors of a typhoon, such as convergence of cirri, shifts of the wind, or unusual swell, were all absent. No typhoon warning had been issued by the near-by broadcasting stations of Pratas and Keelung.

According to the log book, at 4 a. m. on September 1, when the *Silversandal* was approaching the northern entrance of the Formosa Channel, a gentle breeze was blowing from the northeast. The weather was noted down as fine and clear by the officer of the deck. At 8 a. m. the wind had increased one point in force and shifted to east by north, while short-lived rain squalls gave indications of unsettled weather. Two hours later the storm was on and the wind had increased to gale force. At 10:50 a. m. the wind was blowing whole gale and the speed of the ship had to be reduced. The barometer dropped to 744.5 mm. at 11:30, with the wind from east by north, of hurricane force. The blast of the whistle of the ship was lost in the roar of the wind and could not be heard by the members of the crew. The rain was blinding and the visibility so low that one end of the ship could not be seen from the other. At noon the wind was from the east and had dropped from force 12 to force 10, and by 4 p. m. the wind had veered to south-southeast and decreased to force 5 while the barometer had risen to 752.3 with general improvement of weather conditions.

This typhoon must have originated west of southern Formosa and passed north of Pratas in its westward motion without affecting considerably the barometers of western Formosa and of Pratas. No definite information on the origin and violence of the storm could be secured until the *Silversandal* made the port of Manila and the officers and log book of the ship were consulted.

The disturbance moved westward unnoticed throughout the evening and night of September 1, but at 6 a. m. on September 2, there were evident signs of a typhoon approaching Hong Kong from the southeast. About noon the gale developed with surprising suddenness in the British colony and many native craft were caught unawares.

Two unusual features characterized the passage of this typhoon close to Hong Kong—the unsteadiness of the winds and the oscillations of pressure. The wind vane of Hong Kong Observatory is reported as having made five complete revolutions between 8 and 11 p. m. In the words of the director of the royal observatory, the barometer trace was the most remarkable ever recorded at the observatory, the pen oscillating rapidly to the extent of a tenth of an inch between 8 and 9 p. m. Lowest pressure was 739.9 mm. at 2:55 p. m., attended by wind rising to a velocity of 124 kilometers per hour in the maximum gust, but some hours later the wind rose suddenly again to high velocities between 8 and 10 p. m., reaching a maximum velocity of 151 kilometers per hour in a gust at 9 p. m.

The mean speed of progression of the typhoon from the west of southern Formosa to the Asiatic Continent was about 8.6 miles per hour. The weather maps of September 4 show the center of the typhoon filling up over Kwangsi Province.

TROPICAL STORMS OF SEPTEMBER, 1931, IN NORTH AMERICAN WATERS

By W. F. McDONALD

September was marked in American tropical waters by no less than seven storms. At least three of these storms reached full hurricane intensity, one of them becoming a major disaster. Tracks of three storms which moved across the Caribbean Sea are illustrated elsewhere in this issue, in connection with a special report on hurricane damage in Porto Rico, the only United States possession to suffer by a hurricane during the month.

The first cyclonic development of the month began north of the Virgin Islands on the 1st, and was of minor intensity. It moved westward during the next six days reaching the western end of Cuba where it recurved northeastward on the 7th. The only gales reported during the progress of this relatively mild disturbance were over Mona Passage on the 2d, but flooding rains which caused great damage and some loss of life in Porto Rico may be attributed to conditions attending this cyclone.

While the first disturbance was in progress, another was developing in the southeastern Caribbean Sea. It was first suspected not far from Barbados on the 6th. The third for the month was also arising almost simultaneously in the Pacific a short distance southeastward from Acapulco, Mexico, where the American steamship *Marian Otis Chandler* encountered a cyclonic gale on the 6th. Both of these disturbances developed into storms of relatively small diameter but of full hurricane intensity as they progressed during the succeeding week.

While these two hurricanes were in simultaneous progress, and approaching the peak of their intensity, the